WE CLAIM:

-1-

A composite material which comprises:

(a) finely divided expanded graphite consisting essentially of single platelets which are less than 200 microns in length; and

(b) a polymer having the expanded graphite dispersed therein.

-2-

A composite material which comprises:

(a) finely divided expanded graphite having single platelets with a length less than about 200 microns and a thickness of less than about 0.1 microns; and

(b) a polymer having the expanded graphite particles dispersed therein, wherein the composite material contains up to about 50% by volume of the graphite.

-3-

The composite material of Claim 2 wherein the graphite platelets are present in an amount so that composite material is conductive.

-4-

The composite material of any one of Claims 1, 2 or 3 wherein the polymer is a thermoplastic or thermoset polymer.

-5-

The composite material of any one of Claims 1, 2 or 3 wherein a graphite precursor contained a chemical which was vaporized at least in part by heat to form the expanded graphite.

-6-

The composite material of any one of Claims 1, 2 or 3 wherein the expanded graphite has been formed in a radiofrequency wave applicator by heating a graphite precursor with the radiofrequency waves.

-7-

The composite material of any one of Claims 1, 2 or 3 wherein the polymer and the expanded graphite have been heated together with a radiofrequency wave applicator.

-8-

The composite material of any one of Claims 1, 2, or 3 wherein the polymer is an epoxy resin.

-9-

The composite material of any one of Claims 1, 2 or 3 wherein a precursor graphite has been treated with a fuming oxy acid and heated to form the expanded graphite.

-10-

The composite material of any one of Claims 1, 2 or 3 wherein the polymer is thermoplastic and is selected from the group consisting of polyamides, proteins, polyesters, polyethers, polyurethanes, polysiloxanes, phenol-formaldehydes, urea-formaldehydes, melamine-formaldehydes, celluloses, polysulfides, polyacetals, polyethylene oxides, polycaprolactams, polycaprolactons, polylactides, polyimides, and polyolefins.

-11-

The composite material of any one of Claims 1, 2 or 3 which contains less than about 8% by weight of the expanded graphite.

-12-

A method for preparing a shaped composite which comprises:

(a) providing a mixture of a finely divided expanded graphite consisting essentially of single platelets which are essentially less than 200 microns in length and with a polymer with the expanded dispersed therein; and

(b) forming the shaped composite material from the mixture.

-13-

A method for preparing a shaped composite material which comprises:

(a) providing a mixture of an expanded graphite having single platelets with a length less than about 200 microns and a thickness of less than about 0.1 microns and a polymer with the expanded graphite dispersed therein, wherein the composite material contains up to about 50% by volume of the expanded graphite platelets;

(b) forming the shaped composite material from the mixture.

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The method of Claims 12 or 13 wherein the expanded graphite is provided in the polymer in an amount sufficient to render the shaped composite conductive.

-15-

The method of Claims 12 or 13 wherein the polymer is a thermoplastic or thermoset polymer.

-16-

The method of Claims 12 or 13 wherein a graphite precursor of the expanded graphite platelets contain an expanding chemical which is at least in part evaporated to form the expanded graphite.

-17-

The method of Claims 12 or 13 wherein the expanded graphite is formed in a radiofrequency wave applicator by heating the graphite precursor with radiofrequency waves.

-18-

The method of Claims 12 or 13 wherein an graphite precursor is treated with a fuming oxy acid and heated to provide the expanded graphite.

-19-

The method of any one of Claims 12 or 13 wherein the polymer is a curable thermoset resin which is mixed with the expanded graphite and cured.

-20-

The method of Claims 12 or 13 wherein the shaped composite material contains less than 8% by weight of the expanded graphite.

-21-

In a battery containing ions the improvement in the anode which comprises a finely divided microwave or RF expanded graphite having single platelets with a length less than about 200 microns and a thickness of less than about 0.1 microns.

-22-

In a catalytic conversion of an organic compound to hydrogen with a catalytic material deposited on a substrate the improvement in the substrate which comprises a finely divided microwave or RF expanded graphite having single particles with a length less than about 200 microns and a thickness of less than about 0.1 microns.

-23-

A process for producing platelets of expanded graphite which comprises:

(a) expanding graphite intercalated with a chemical which expands upon heating to produce expanded graphite platelets; and

(b) reducing the expanded graphite platelets so that essentially all of the individual platelets are less than 200 microns in length, 0.1 micron in thickness.

-24-

The process of Claim 23 wherein the chemical agent is an inorganic oxy acid.

-25-

The process of any one of Claims 23 or 24 wherein the expanding is by microwave or RF heating.

-26-

The composite material of Claim 1 wherein the expanded graphite is grafted with acrylamide.

-27-

The method of Claim 12 wherein the expanded graphite is grafted with acrylamide.

-28-

The method of Claim 23 wherein the expanded graphite is grafted with acrylamide.